Terms of Use

for the solar radiation dataset "ISIS" of Deutsches Zentrum für Luft- und Raumfahrt e.V. (hereinafter called „DLR")

Description

The ISIS dataset (Irradiance at the Surface derived from ISCCP cloud data) consists of three-hourly values of direct normal and global irradiances at the surface for a time period of 21 years (1984-2004) that have been derived by means of one dimensional radiative transfer computations based on satellite observations of clouds, aerosol, and trace gases. The necessary input parameters have been obtained from various sources. Most parameters were adopted from the FD (flux D series) input dataset of the International Satellite Cloud Climatology Project (ISCCP), composed of 6596 equal area grid boxes with a surface of 280 x 280 km^2 (Zhang et al 2004), in particular, all cloud parameters, the mean topographic altitude, as well as the average solar zenith angle for every three hourly interval have been extracted for every grid box. For that reason, the derived global irradiance (GHI) should be close to the global irradiance in the FD data set and the strength of ISIS is that it additionally provides direct normal irradiance (DNI), as required e.g. for the operation and planning of concentrating solar power plants.

All cloud parameters (cloud top pressure, cloud optical thickness, cloud top temperature, cloud type, cloud amount) stem from the ISCCP FD data set, which in turn represent the ISCCP D1 cloud data set (Rossow and Schiffer 1999). Cloud top height has been derived from cloud top pressure, while cloud geometrical thickness was always set to 1000m. For water clouds the transformation of liquid water content and effective droplet radius to optical properties is done with the parameterisation of Hu and Stamnes (1993) with an effective droplet radius of 10 µm. For ice clouds the parameterisation of Yang and Key (Yang et al., 2000; Key et al., 2002) is used with an effective particle radius of 30 µm. This is consistent with the cloud optical properties retrieved in ISCCP (Rossow et al., 1996). The mean topographic altitude, based on the U.S. Navy dataset of the National Center for Atmospheric Research NCAR, is also extracted directly from ISCCP FD. The average solar zenith angle, according to the Astronomic Almanac of 1950-2050, is taken from ISCCP FD as well. Total ozone and water vapour vertical columns have been adopted in the ISCCP project (and used for ISIS) from various datasets. The ozone columns stem from data of the Total Ozone Mapping Spectrometer (TOMS, Version 7, Mc-Peters et al. 1996). In case these were not available, data of the Television Infrared Observation Satellite (TIROS) Operational Vertical Sounder (TOVS) has been used. Water vapour profiles have been produced using the TOVS instrument (Kidwell 1995). Gaps have been filled by a combination of the 5 year means of the Stratospheric Aerosol and Gas Experiment SAGE II for the upper troposphere and stratosphere with p<=200 mbar (Rind and Liao 1997, Liao and Rind 1997) with a 10 year pressure climatology (p>=300 mbar, Oort 1983). Surface albedo values for the solar spectral range are contained in the ISCCP FD input dataset and have been adopted for ISIS also. Atmospheric profiles of trace gases are taken from five US standard atmospheres according to (Anderson et al. 1986): a winter and a summer atmosphere for mid and high latitudes as well as a tropical atmosphere. They comprise vertical profiles of pressure, temperature and particle density for air, ozone, oxygen, water vapour and carbon dioxide up to 50 km altitude.

The assignment of the correct atmospheric profile occurs under consideration of the mean geographical latitude of every ISCCP box. The tropical atmosphere is selected up to 23° North and South of the Equator, the mid latitude atmosphere between ±23° und ±67°, and the high latitude atmosphere further North of 67°N or South of 67°S. In the Northern hemisphere the summer profiles are used between April and September and the winter profiles during the remaining months. In the Southern hemisphere summer and winter are interchanged. Values of water vapour and ozone columns have been scaled to the corresponding ISCCP values. Special attention is given to aerosols that are not treated as in ISCCP FD. For the distribution of aerosols

in the atmosphere a vertical profile of (Shettle 1989) has been assumed. The optical thickness of the tropospheric aerosols has been extracted from the NASA Goddard Institute for Space Studies (GISS) dataset that contains climatological means of the most important aerosol types with a spatial resolution of 4° x 5° (Tegen et al., 1997). In addition, the index by (Sato et al. 1993 + updates) has been used that consists of monthly averages of the optical thickness of the stratospheric aerosols at 550 nm in 7.5° latitude steps.

To derive direct (and global) irradiance at the surface from this input data sets the two-stream solver of Kylling et al. (1995) is used, which is part of the library for radiative transfer (libRadtran, Mayer and Kylling, 2005). The two-stream method solves the linear transport equation applicable to radiative transfer in a vertically inhomogeneous layered media. A 32-band correlated-k parameterisation after Kato et al. (1999) is used for the calculation of spectrally integrated values over the solar spectral range (200-4300 nm). Radiative transfer calculations are carried out separately for clear sky and for each of the 15 ISCCP cloud types assuming homogeneous cloud layers. The results are summed, weighted with the cloud amount of each cloud type and the proportion of clear sky respectively to get 3-hourly irradiance values.

Two versions of the ISIS dataset exist: one includes the impact of stratospheric aerosols while the other one does not.

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§ 1 Acceptance

By downloading the dataset the user accepts the subsequent terms of use.

§ 2 Granting of a right to use

DLR grants the user a non exclusive, non transferable right to use the dataset free of charge. The user does not have the right to grant sublicenses and/or to make available the dataset to third parties.

§ 3 Confidentiality

(1) The user is obliged to treat the dataset as well as possible further technical and commercial information disclosed to him (hereinafter called "confidential information") in a confidential manner and not to reveal the information to third parties for an unlimited period of time.

(2) The above obligation of confidentiality no longer applies if and to the extent as

(a) the confidential information was generally known or accessible, without a breach of this confidentiality agreement;

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(e) DLR has given its prior written consent to a publication.

The user has the burden of proof regarding the existence of such an exception.

§ 4 Warranty / Liability

(1) It is explicitly stated that the dataset is a research result that has not yet been tested under real conditions. Therefore DLR does not guarantee that the dataset is free of defects and useful for the purposes of the user. Warranty claims no matter of what kind are excluded in terms of the fact that the dataset is licensed free of charge.

(2) DLR is liable only in cases of intent and gross negligence. In case of gross negligence the liability for consequential damages or losses (e.g. to other legally protected interests) based on faults of the dataset is excluded. Regardless of the legal nature of any claim DLR shall be liable to the user in case of gross negligence only for direct damage and only to a maximum amount of 10.000,- EUR.

(3) DLR is not aware of any third party rights which are conflicting with the use of the dataset by the user. However, DLR assumes no liability for the infringement of third party rights by the use of the dataset.

§ 5 Applicable Law, Jurisdiction

German law applies to the exclusion of the United Nations Convention on Contracts for the International Sale of Goods. Place of jurisdiction for all disagreements arising out of the use of the dataset is Cologne, Germany.